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(54) RECORD MEDIUM, RECORDER AND REPRODUCING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To prohibit reproduction of an unfair copy dead copied
with an unfair copy machine by recording a digital literary work given with medium
identification information in the unalterable state and buried with the whole or a part
of the same medium identification information as the medium identification
information as an electronic watermark.
SOLUTION: A host computer 91 stores the digital literary work gained from a public
network 92 in a memory 95. Copy generation information is buried in the digital
literary work as the electronic watermark. A recorder provided in a personal computer
90 writes the digital literary work in a recordable disk 108. At this time, an electronic
watermark detection part 104 detects the copy generation information from the digital

literary work, and an electronic watermark insertion part 105 gains the medium identification information from the recordable disk 108 to bury it into the digital literary work as the electronic watermark when the copy generation information is one generation copy approval.

LEGAL STATUS [Date of request for examination]
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[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]
[Date of extinction of right]

CLAIMS

[Claim(s)]

[Claim 1] The record medium characterized by being given in the condition which cannot alter medium identification information, and recording the digital work with which all or a part of the same medium identification information as the medium identification information was embedded as said digital watermarking.

[Claim 2] The record medium according to claim 1 characterized by embedding the no more copy attribute which shows the purport to which an own copy is not permitted any more with said medium identification information to said digital work as said digital watermarking.

[Claim 3] Said medium identification information is a record medium according to claim 1 or 2 characterized by embedding the lot number as digital watermarking at least among medium identification information at said digital work including the lot number at the time of manufacture of the record medium concerned.

[Claim 4] It is a record medium given in any of claims 1-3 characterized by giving said medium identification information to the burst cut field of an optical disk said record medium is an optical disk and they are.

[Claim 5] A storage means to memorize the digital work with which it is the recording apparatus which records a digital work on a record medium, and digital watermarking is embedded, A reception means to receive from an operator directions of the purport which records the digital work memorized by the storage means on a record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the one copy attribute which shows the purport to which the copy of a digital work is once restricted and is permitted in a digital work is embedded as digital watermarking, While rewriting for the no more copy attribute which indicates the purport to which the copy of a digital work is not permitted for the one copy attribute concerned any more to be the read-out means which reads medium identification information from the predetermined field of the record medium which should record a digital work The embedded means embedded in a digital work by making into digital watermarking medium identification information which the read-out means read, The recording device characterized by having a record means to record the digital work with which it was rewritten by the no more copy attribute, and medium identification information was embedded as digital watermarking on a record medium.

[Claim 6] It is the recording device according to claim 5 characterized by for said record medium being an optical disk and the aforementioned read-out means reading

the medium identification information given to the burst cut field of an optical disk.

[Claim 7] A reception means to receive from an operator directions of the purport which reproduces the digital work which is the regenerative apparatus which reproduces the digital work recorded on the record medium, and was recorded on the record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the no more copy attribute which shows the purport to which the copy of a digital work is not permitted any more is embedded as digital watermarking in the digital work, A judgment means to judge whether the medium identification information given to the record medium which recorded the digital work at the end is embedded in the digital work as digital watermarking with the no more copy attribute concerned, The read-out means which reads the medium identification information given to the record medium concerned from the predetermined field of the record medium concerned when embedded, The regenerative apparatus characterized by having the playback means which performs collating with the medium identification information embedded as digital watermarking with the no more copy attribute, and the medium identification information given to the record medium, and reproduces a digital work according to a collating result.

[Claim 8] Said playback means is a regenerative apparatus according to claim 7 characterized by reproducing a digital work only when collating with the medium identification information currently embedded as digital watermarking with the no more copy attribute and the medium identification information given to the record medium is performed and both are in agreement.

[Claim 9] It is the regenerative apparatus according to claim 7 or 8 characterized by for said record medium being an optical disk and the aforementioned read-out means reading the medium identification information given to the burst cut field of an optical disk.

[Claim 10] It is the record medium which recorded the digital work. To said digital work The local information which shows the use area of the recording device which recorded the work concerned on the record medium, The local information given to the package media which were recording the digital work concerned, [when any or 1 of the local information which shows the provider who supplied the digital work concerned are embedded in the digital work as digital watermarking and playback of said digital work is directed] The record medium characterized by verifying the existence of infringement of the copyright of said digital work from the local information on a regenerative apparatus and the local information embedded as digital watermarking being collated.

[Claim 11] A storage means to memorize the digital work with which it is the recording apparatus which records a digital work on a record medium, and digital watermarking is embedded, A reception means to receive from an operator directions of the purport which records the digital work memorized by the storage means on a record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the copy authorization attribute which shows the purport to which the copy of a digital work is permitted more than once at least is embedded in the digital work, The local information which shows the own use area of a recording apparatus, the local information given to the package media which were recording the digital work concerned, The recording device characterized by having the embedded means embedded in a digital work by making into digital watermarking any or 1 of the local information which shows the provider who supplied the digital work concerned, and a record means to record the digital work with which local information was embedded as digital watermarking on a record medium.

[Claim 12] A reception means to receive from an operator directions of the purport which reproduces the digital work which is the regenerative apparatus which reproduces the digital work recorded on the record medium, and was recorded on the record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the copy authorization attribute which shows the purport to which the copy of a digital work is permitted more than once at least is embedded, The local information which shows the use area of the recording device which recorded the digital work on the record medium, The local information given to the package media which were recording the digital work concerned in the past, A judgment means any or to judge whether one is embedded apart from the copy authorization attribute among the local information which shows the provider who supplied the digital work concerned, The regenerative apparatus characterized by having the playback means which performs collating with the local information embedded as digital watermarking, and the local information which shows the own use area of a regenerative apparatus, and reproduces a digital work according to a collating result when judged with any 1 area information being embedded.

[Claim 13] Said playback means is a regenerative apparatus [claim 14] according to claim 12 characterized by reproducing a digital work only when collating with the local information embedded as digital watermarking when judged with any one local information being embedded, and the local information which shows the own use area of a regenerative apparatus is performed and both are in agreement. The record medium characterized by restricting the playback quality of the digital work concerned

based on the quality limit information on a regenerative apparatus when it is the record medium which recorded the digital work, the quality limit information that a limit is imposed is embedded by said digital work in the digital work as digital watermarking in the playback quality at the time of playback of a digital work and playback of said digital work is directed.

[Claim 15] For quality limit information, a digital work is a record medium according to claim 14 characterized by having restricted either [at least] the image quality at the time of playback of digital image data, or the tone quality at the time of playback of digitized voice data including either [at least] digital image data or digitized voice data.

[Claim 16] It is the record medium according to claim 15 which the Rhine interpolation or pixel interpolation is performed according to a predetermined parameter, and is characterized by said quality limit information having restricted the image quality at the time of playback of digital image data by preparing said predetermined parameter upper limit in case digital image data are reproduced.

[Claim 17] It is the record medium according to claim 15 which decode processing based on a predetermined transfer rate is performed, and is characterized by said quality limit information having restricted the image quality at the time of playback of digital image data by preparing a upper limit in said predetermined transfer rate in case digital image data are reproduced.

[Claim 18] Said playback quality information is a recording device medium according to claim 15 characterized by having restricted the tone quality at the time of playback of digitized voice data by preparing a upper limit in the sampling frequency at the time of decode of digitized voice data.

[Claim 19] Said playback quality information is a record medium according to claim 15 characterized by having restricted the tone quality at the time of playback of digitized voice data by preparing a upper limit in the quantifying bit number at the time of performing analog to digital conversion to digitized voice data.

[Claim 20] A storage means to memorize the digital work with which it is the recording apparatus which records a digital work on a record medium, and digital watermarking is embedded, A reception means to receive from an operator directions of the purport which records the digital work memorized by the storage means on a record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the copy authorization attribute which shows the purport to which the copy of a digital work is permitted more than once at least is embedded in the digital work, The recording device characterized by having the

embedded means embedded in a digital work by making into digital watermarking quality limit information that a limit is imposed on the playback quality at the time of playback of a digital work, and a record means to record the digital work with which quality limit information was embedded as digital watermarking on a record medium. [Claim 21] A reception means to receive from an operator directions of the purport which reproduces the digital work which is the regenerative apparatus which reproduces the digital work recorded on the record medium, and was recorded on the record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the copy authorization attribute which shows the purport to which the copy of a digital work is permitted more than once at least is embedded, A judgment means to judge whether the quality limit information that a limit is imposed on the playback quality at the time of playback of a digital work is included in digital watermarking in a digital work apart from copy authorization information, The regenerative apparatus characterized by having the playback means which reproduces a digital work according to the limit shown in quality limit information when judged with quality limit information being embedded.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the record medium, recording device,

and regenerative apparatus which aim at protection of copyright.

[0002]

[Description of the Prior Art] Works, such as a movie and music, are in the inclination it to become in use to be digitized, and to be used where an information compression is carried out. The compression[digitization and]-ized work does not almost have degradation of image quality and tone quality, and a viewer can always appreciate a work by the highest image quality and tone quality. Moreover, even if the work by which the image quality and tone quality were digitized to deteriorating remarkably when the work of an analog condition repeated dubbing repeatedly repeats dubbing how many times, degradation of image quality does not produce it.

[0003] If a view is changed, it can be said that an illegal copy and an unjust alteration are very easy for the digitized work compared with it of an analog condition, and it is exposed to a defenseless condition to an literary piracy action. Generally copyright is the right which included various rights, such as the right of reproduction copyright, a right of oral statement, lending rights, a right of display, a right of a name display, and a right of identity maintenance. In it, the right of reproduction copyright about the duplicate of a work influences a copyright person's advantages and disadvantages greatly. According to the Copyright Act, the copyright person has the exclusive right which reproduces a work (Article 21 of Copyright Act), and the action which saves the digitized work at a memory top or storage, such as a hard disk, serves as infringement of the right of reproduction copyright, unless it stops at the range of private use (Article 30 of Copyright Act). Unless the action which records the work downloaded from the provider by the Internet on a record medium, and the action which copies the work currently recorded on the software package to other record media stop at the range of private use similarly, it is in charge of infringement of the right of reproduction copyright.

[0004] The approach of embedding the information about protection of copyrights including the right of reproduction copyright as digital watermarking at a work attracts expectation of many copyright people and an engineer as an approach of preventing these infringement actions. Data which serve as digital watermarking (water mark) with the body section of a work (neither a data header nor control information corresponds to this body section data.) The information multiplexed by the field of arbitration called contents in this below is said. "Multiplexing of digital watermarking" is realized here by arranging two or more identification codes identifiable as digital watermarking to contents. For example, two or more identification codes are "10010110.... It is ", and when contents are image data, each pixel of image data is

specified as the thing made to correspond to 1 bit of an identification code sequentially from an upper left corner. And if the pixel value of each pixel is in agreement with an identification code, the original pixel value is adopted, and if not in agreement, it will consider as a new pixel value. If the above actuation is repeated about all the bits of an identification code, digital watermarking can obtain the image data by which multiplex was carried out.

[0005] Since there is a property in which the point multiplexed is unclear for digital watermarking, in view of this property, it is called "Digital watermarking is embedded in contents." By the above-mentioned example, although each pixel of image data was made equivalent to 1 bit of an identification code sequentially from an upper left corner, if arrangement of an identification code is randomized and an identification code is decentralized, it will become still more unclear where [of a work] digital watermarking is multiplexed. If the information for protection of copyrights is embedded as mentioned above at a work, the information for protection of copyrights can be concealed to altitude, and the alteration of the concealed information will become very difficult. In addition, refer to the well-known reference, such as "<basic of digital watermarking> Matsui Kineo Morikita Shuppan", "a Nikkei electronics . February 24, 1997 issue special edition <digital watermarking keeps multimedia age>", and "digital-watermarking (code system of multimedia age) Inoue **** Maruyama arts-and-sciences publication", for an approach to embed digital watermarking, its advantage, etc. about the more detailed technical contents about digital watermarking.

[0006] There are some which are called copy generation information to current and the thing which has gone up to the candidate of a common protocol among the information which should be embedded as digital watermarking. Copy generation information has "the copy authorization (copy free)" which can be copied freely, "the one-generation copy authorization (one copy)" which can be copied one generation, and "more than this copy prohibition (no more copy)" and "the ban (never copy) on a copy" which accepts no copy.

[0007] Drawing 15 is drawing showing the copy control which used copy generation information. Henceforth, the copy control using copy generation information is explained, referring to this Fig. In this Fig., the recording device is built in the personal computer 81, and this personal computer 81 has memorized the work downloaded from the network 82. At the work of this Fig., copy generation information is embedded as digital watermarking, and the personal computer 81 having a recording device performs record processing to the record medium based on this copy generation information. The record media in this Fig. are recordable disks, such as DVD-RAM,

DVD-R, and DVD-RW, and a recording apparatus is drive equipment of this recordable disk.

[0008] As shown in an arrow head y1 here, when digital watermarking is "a ban on a copy", as for a recording device, record to a record medium is forbidden. Moreover, as shown in an arrow head y2, when digital watermarking is "more than this copy prohibition", as for a recording device, record to a record medium is forbidden. As shown in an arrow head y3, when digital watermarking is "copy authorization", record to a record medium is performed.

[0009] As shown in an arrow head y4, when digital watermarking currently embedded at the work is "one-generation copy authorization", after detecting this digital watermarking and transposing this to "more than this copy prohibition", it embeds again at a work and records on a record medium. Namely, if the embedded copy generation information is set as "one-generation copy authorization", since the copy of a limitation will be attained once, an operator can record a work on a record medium in the range enjoyed individually. Thus, restricting once and permitting the duplicate of a work meets individual and the pneuma [consent / a copyright person] of the law of Article 30 of the Copyright Act no **** to be when using a work in the limited range, such as between domestic and a small number of friend.

[0010] Then, playback control of the work according to copy generation information is explained. Drawing 16 is the explanatory view showing the playback control which used copy generation information. In this Fig., a regenerative apparatus is the noncommercial DVD player 83, and reproduces the image recorded on the record medium on a display 84. At the time of the playback from disks only for playbacks, such as CD-ROM and DVD-ROM, even if it is which digital watermarking, playback is permitted, and the noncommercial DVD player 83 performs playback control for which copy generation information was used only in the case of the recordable disk.

[0011] As this Fig. is shown in an arrow head y5, when copy generation information is "a ban on a copy", the playback from a record medium is forbidden. Because, although the just recording device should not record the work with which copy generation information was set up with "the ban on a copy" on a record medium and copy generation information shows "the ban on a copy", that the work is recorded is a proof on which the work concerned is recorded unjustly.

[0012] As shown in an arrow head y6, also when copy generation information shows "one-generation copy authorization", there is misgiving by which it infringes on copyright. Because, that it is common being transposed to "more than this copy prohibition" as for copy generation information, there is no trace of such replacement,

and the work is recorded on the record medium while it has been "one-generation copy authorization" when the work of "one-generation copy authorization" is recorded on a record medium is a proof on which the work is recorded using the inaccurate copy machine.

[0013] As shown in arrow heads y7 and y8, when copy generation information is "more than this copy prohibition", or when it is "copy authorization", a regenerative apparatus reproduces the work concerned.

[0014]

[Problem(s) to be Solved by the Invention] By the way, in the protection of copyrights using digital watermarking as shown in the conventional technique, it may restrict once, a setup of "one-generation copy authorization" of allowing record of a work may be taken by the foul trick, and the infringement action of the right of reproduction copyright may be performed. Infringement of the right of reproduction copyright which took a setup of "one-generation copy authorization" to the foul trick is performed by using an inaccurate copy machine. An inaccurate copy machine is equipment which reads the data currently recorded on a certain record medium per sector, and is recorded on other record media as it is here. Namely, although it sets at the time of record to a record medium and the work occupies two or more sectors on an optical disk The processing which reads data from each of two or more occupancy sectors which can set an inaccurate copy machine to the record medium of a copied material, The processing which writes the read data in the sector to which a copy place record medium corresponds It repeats about all the sectors on a record medium (the copy processing made by doing in this way is called dead copy, and there are some which are realized simply in the copy machine in which a dead copy is possible by installing the copy tool of dedication in a general purpose computer.). The copy machine of this gestalt performs the dead copy through an internal memory. That is, a dead copy is performed by repeating the processing which reads data from each of two or more occupancy sectors which can be set to the record medium of a copied material to an internal memory, and the processing which writes the data read to the internal memory in the sector to which a copy place record medium corresponds about all the sectors on a record medium.

[0015] Drawing 17 is drawing supposing the scene which carries out the dead copy of the work with which digital watermarking is embedded using an inaccurate copy machine. The procedure of this illegal copy is explained referring to drawing 17 . After transposing copy generation information to "more than this copy prohibition" from "one-generation copy authorization" as shown in an arrow head y4 if the copy

generation information which the personal computer 81 had memorized the work downloaded from the network 82, and was embedded at the work is "one-generation copy authorization" in this Fig., it records on a record medium 86. Those who are going to infringe on the copyright of the work concerned here made the sector unit copy other record media to the inaccurate copy machine 85 as a copy place, as the record medium 86 with which copy generation information recorded the work transposed to "more than this copy prohibition" is made into a copied material as shown in an arrow head y9, and it is shown in an arrow head y10. If it does so, a record medium 87 will be generated by this copy actuation as a duplicate object of a record medium 86. If the same procedure is repeated, as shown in arrow heads y11 and y12, a record medium 88 and a record medium 89 will be generated as a duplicate object of a record medium 86.

[0016] Since all show "more than this copy prohibition", as shown in drawing 16 , in a regenerative apparatus, it will usually pass along the copy generation information on these record media 87, a record medium 88, and a record medium 89, and it will be reproduced. namely, the above —— if an inaccurate copy machine is used, the any number of generations work with which copy generation information was set up with "one-generation   copy   authorization"   will   be   copied,   and right-of-reproduction-copyright protection by setup of "one-generation copy authorization" of copy generation information will be made nominal.

[0017] The purpose of this invention is offering the record medium which can forbid playback of such a duplicate object, a recording device, and a regenerative apparatus, even if a dead copy is performed by the inaccurate copy machine and an inaccurate duplicate object is obtained.

[0018]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the record medium concerning this invention is characterized by being given in the condition which cannot alter medium identification information, and recording the digital work with which all or a part of the same medium identification information as the medium identification information was embedded as said digital watermarking. Moreover, a storage means by which the recording apparatus concerning this invention memorizes the digital work with which digital watermarking is embedded, A reception means to receive from an operator directions of the purport which records the digital work memorized by the storage means on a record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the one copy attribute which shows the purport to

which the copy of a digital work is once restricted and is permitted in a digital work is embedded as digital watermarking, While rewriting for the no more copy attribute which indicates the purport to which the copy of a digital work is not permitted for the one copy attribute concerned any more to be the read-out means which reads medium identification information from the predetermined field of the record medium which should record a digital work It is characterized by having the embedded means embedded in a digital work by making into digital watermarking medium identification information which the read-out means read, and a record means to record the digital work with which it was rewritten by the no more copy attribute, and medium identification information was embedded as digital watermarking on a record medium.

[0019] Moreover, a reception means to receive from an operator directions of the purport which reproduces the digital work with which the regenerative apparatus concerning this invention was recorded on the record medium, A decode means to decode digital watermarking currently embedded at the digital work if directions are received, When the no more copy attribute which shows the purport to which the copy of a digital work is not permitted any more is embedded as digital watermarking in the digital work, A judgment means to judge whether the medium identification information given to the record medium which recorded the digital work at the end is embedded in the digital work as digital watermarking with the no more copy attribute concerned, The read-out means which reads the medium identification information given to the record medium concerned from the predetermined field of the record medium concerned when embedded, Collating with the medium identification information embedded as digital watermarking with the no more copy attribute and the medium identification information given to the record medium is performed, and it is characterized by having the playback means which reproduces a digital work according to a collating result.

[0020]

[Embodiment of the Invention] Hereafter, three operation gestalten are explained, referring to a drawing.

(The 1st operation gestalt) The personal computer 90 is equipped with the recording device in the 1st operation gestalt. Drawing 1 is drawing showing the interior of the personal computer 90 having a recording device, and a host computer 91. The personal computer 90 has memorized the work downloaded from the network 92. At the work of this Fig., copy generation information is embedded as digital watermarking, and the recording device with which the personal computer 90 was equipped performs record processing to the record medium based on this copy generation information. A

personal computer 90 consists of a host computer 91 and a recording device in drawing 1 .

[0021] A host computer 91 is equipped with the interface control section 94 for performing the communication adapter 93 for performing the communication link with a public network 92, and data transmission with a recording apparatus, memory 95, and CPU96. Works, such as an image and music, are acquired in memory 95 through a network 92, and the download program and work for recording this on a record medium are stored in it. At the work stored in memory here, copy generation information is embedded as digital watermarking. In recording this work on the recordable disk 108, a host computer 91 outputs a record command and the work concerned to a recording device through an external bus.

[0022] Loading of the recordable disk 108 is possible for a recording apparatus, and as a work is written in the recordable disk 108 and shown in drawing 1 according to the record command from a host computer 91, it is equipped with the signal-processing section 101, the interface control section 102, the optical head 103, the digital-watermarking detecting element 104, the digital-watermarking insertion section 105, and CPU107. The work which should be recorded on the recordable disk 108 is the dynamic-image data and voice data which were compressed according to MPEG (Moving Picture Experts Group) specification, and the record medium which recorded this is reproduced using the regenerative apparatus of dedication.

[0023] The signal-processing section 101 performs modulation processing to the data which it is going to write in the recordable disk 108 from now on, and gives an error correction sign. The interface control section 102 controls I/O with an external bus and the signal-processing section 101. Since the host computer 91 has connected with this external bus, if a host computer 91 outputs a work, the interface control section 102 will receive this work through an external bus, and will output it to the digital-watermarking detecting element 104.

[0024] The optical head 103 is driven according to the seeking device which is not illustrated, and writes in data by irradiating laser light at an optical disk. If, as for the digital-watermarking detecting element 104, the interface control section 102 outputs a work, the copy generation information currently embedded as digital watermarking in this work will be detected, and this copy generation information will judge any are shown among "copy authorization", "more than this copy prohibition", "a ban on a copy", and "one-generation copy authorization."

[0025] When only the copy of time cost is permitted in copy generation information, the digital-watermarking insertion section 105 acquires the identification information

of a record medium from the predetermined field on a disk, and embeds this as digital watermarking from a host computer 91 through the interface control section 102 at a work. The physical structure of an optical disk is explained and it explains where said predetermined field is located in this optical disk here. Drawing 4 is drawing having shown the physical structure of the recordable disk 108. Like drawing 4 , the field on an optical disk is roughly divided into two, and has the 1st record section which records main data, and the 2nd record section which records subinformation other than main data. The 2nd record section is a field only for playbacks called BCA (Burst Cutting Area) currently formed by removing the reflective film on an optical disk in the shape of a stripe, and the above-mentioned predetermined field says the field only for these playbacks. Various information is written in this BCA and the data which are a maximum of 188 bytes can be stored. The digital-watermarking insertion section 105 acquires all or some of data of these 188Byte(s) as medium identification information. Medium identification information means the identification information for discriminating the record medium concerned from other record media here. If medium identification information is acquired from BCA, the digital-watermarking insertion section 105 will receive the work transmitted through an external bus through the interface control section 102, and will embed medium identification information in a work as digital watermarking.

[0026] CPU107 interprets reception and its command for the command which the host computer 91 published through an external bus and the interface control section 102, and controls a head location, rotational speed, etc. of the optical head 103. The work transmitted to the external bus at the time of the writing of a work is received through the interface control section 102, and write-in actuation is performed. If the copy generation information which the digital-watermarking detecting element 104 detected here "copy authorization" Becomes, CPU107 will write the work received through the interface control section 102 just like that in the recordable disk 108, and the writing of a work will be forbidden if the copy generation information which the digital-watermarking detecting element 104 detected "a ban on a copy" ban ["more than this copy prohibition" and] Becomes. If it is "one-generation copy authorization", while transposing the copy generation information to "more than this copy prohibition", after directing to embed medium identification information as digital watermarking to the work in the digital-watermarking insertion section 105, the work is recorded on the recordable disk 108.

[0027] Such record control is realized by performing procedure of the flow chart which CPU107 shows to drawing 2 . Henceforth, the control procedure of CPU107 in

the case of newly inserting the identification information of a medium as digital watermarking is described using drawing 2 . The digital-watermarking detecting element 104 is made to detect copy generation information as digital watermarking from the inside of received data at step S401 first. In step S402, CPU107 branches to the processing according to the contents of the copy generation information in digital watermarking. When copy generation information is "copy authorization", record of a work is performed on a disk at step S403. When copy generation information is "more than this copy prohibition" or "a ban on a copy", record of a up to [a disk] is stopped by step S408. When copy generation information is "one-generation copy authorization", the identification information of a record medium is read from BCA on a disk at step S405. Next, after ordering the digital-watermarking insertion section 105 so that copy generation information may be transposed to "more than this copy prohibition" from "one-generation copy authorization", the read medium identification information is delivered to the digital-watermarking insertion section 105, and it is made to bury and **** in a work at step S406 by making into digital watermarking identification information of the record medium acquired from BCA. Then, record on a disk is performed in step S407.

[0028] Drawing 3 is drawing showing the copy control which used copy generation information. Henceforth, the copy control using copy generation information is explained, referring to this Fig. As shown in an arrow head y21 here, when digital watermarking is "a ban on a copy", record to a record medium is forbidden. Moreover, as shown in an arrow head y22, when digital watermarking is "more than this copy prohibition", record to a record medium is forbidden.

[0029] As shown in an arrow head y23, when digital watermarking is "copy authorization", record to a record medium is performed. As shown in an arrow head y24, when digital watermarking currently embedded at the work is "one-generation copy authorization", while detecting this digital watermarking and transposing this to "more than this copy prohibition", it embeds again at a work by making into digital watermarking medium identification information read from BCA, and records on a record medium.

[0030] In addition, after performing record to a record medium in this case, it is desirable to order a host computer 91 so that the work which memory 95 has memorized may be eliminated. Thus, it is because there is no reason for the work whose copy generation information is "one-generation copy authorization" existing forever, and having set up copy generation information with "one-generation copy authorization" on memory 95 if elimination of a work is not ordered.

[0031] Then, the regenerative apparatus in this operation gestalt is explained. Medium identification information reproduces the work currently embedded as digital watermarking with copy generation information, and this regenerative apparatus has the internal configuration shown in drawing 5 . Drawing 5 shows the block block diagram of the regenerative apparatus in the 1st operation gestalt. As shown in drawing 5 , a regenerative apparatus consists of the optical head 203, the signal-processing section 204, a digital-watermarking detecting element 205, the decode section 206, and CPU201. In addition, there are the optical disk and the recordable disk 108 only for playbacks in the optical disk with which a regenerative apparatus is loaded as a disk 202 in a regenerative apparatus.

[0032] The signal-processing section 204 restores to the signal read in the disk 202 through the optical head 203, and performs an error correction etc. The digital-watermarking detecting element 205 detects the medium identification information currently embedded as digital watermarking from this work, and copy generation information, when the data which the optical head 203 read from the disk 202 are a work.

[0033] The decode section 206 restores the work read from the disk 202, and outputs it to the display unit and loudspeaker equipment which were connected outside as a video signal and a sound signal. If playback orders by the operator, CPU201 will control a head location, rotational speed, etc. of the optical head 203, and will control to read data from an optical disk 202. Error correction processing and recovery processing are performed by the signal-processing section 204, and if digital watermarking is detected from the work with which the digital-watermarking detecting element 205 was read from the disk 202, CPU201 will perform playback control based on the digital watermarking.

[0034] The control procedure of this CPU201 is shown in the flow chart of drawing 6 . The control procedure in this regenerative apparatus when the identification information of a medium is inserted as digital watermarking is described referring to drawing 6 henceforth. In step S701 of drawing 6 , CPU201 acquires the information on the disk type of the disk 202 with which the regenerative apparatus was loaded. When a disk type is a disk only for playbacks, it is henceforth made step S710 and playback from a disk is performed. When a disk type is a recordable disk, there is misgiving on which the work copied unfairly is recorded in a disk 202. CPU201 makes the copy generation information currently embedded as digital watermarking to the data read from the disk 202 to the digital-watermarking detecting element 205, and the identification information of a disk detect in step S703 that the truth should be

attested. In step S704, CPU201 judges the contents of copy generation information after detection. Since it is thought that the work currently recorded on the disk 202 does not need to verify the existence of infringement of the copyright when copy generation information is "copy authorization", playback from a disk is performed at step S710.

[0035] When copy generation information is "one-generation copy authorization", there is misgiving by which it infringes on copyright. Because, that it is common being transposed to "more than this copy prohibition" as for copy generation information, there is no trace of such replacement, and the work is recorded on the record medium while it has been "one-generation copy authorization" when the work of "one-generation copy authorization" is recorded on a record medium is a proof on which the work is recorded unjustly. Therefore, when the copy generation information currently embedded at the work recorded on the record medium is "one-generation copy authorization", it shifts to step S706 and the playback is forbidden.

[0036] Also when copy generation information is "a ban on a copy", there is misgiving by which it infringes on copyright. Because, as for the just recording device, copy generation information should not record "a ban on a copy", and the set-up work on a record medium, and that the work is recorded on the record medium with "a ban on a copy" is a proof on which the work is recorded unjustly. Therefore, when the copy generation information currently embedded at the work recorded on the record medium is "one-generation copy authorization", it shifts to step S706 and the playback is forbidden.

[0037] When copy generation information is "more than this copy prohibition" here, it is possible that this copy generation information was justly recorded by the recording device since "one-generation copy authorization" and the set-up copy generation information were replaced. However, deciding promptly in this way is dangerous, and there is misgiving to which this work was also copied unjustly. When copy generation information copies the work transposed to "more than this copy prohibition" from "one-generation copy authorization" to another record medium using an inaccurate copy machine (i.e., also when the record medium concerned is the copy of the second generation), it is because copy generation information is set to the work by "more than this copy prohibition."

[0038] However, medium identification information is embedded as digital watermarking at the work, and if the medium identification information read in the record medium and the medium identification information embedded in the work are collated, it can judge [what the work was justly recorded for this record medium on by

the recording device, and] whether a work is unjustly recorded by the inaccurate copy machine. <u>Drawing 7</u> is an explanatory view for explaining prohibition of playback by the regenerative apparatus in this operation gestalt. In this Fig., a record medium 71 is a record medium with which the recording device recorded the work on normal, and a record medium 72 is the duplicate object obtained by using a copy machine inaccurate as a copied material in the record medium 71. Since copy generation information is set as "more than this copy prohibition" and the medium identification information in BCA and the medium identification information of a record medium 71 currently embedded as digital watermarking correspond as shown in the interior of a frame w1, as shown in an arrow head y31, it is usually reproduced at a passage. On the other hand, playback is forbidden as a record medium 72 is shown in the interior of a frame w2, and copy generation information is set as "more than this copy prohibition", and it is shown in an arrow head y32, since the medium identification information in BCA and the medium identification information currently embedded as digital watermarking are inequalities.

[0039] Since the medium identification information which embedded the medium identification information which can identify each disk at the time of record as digital watermarking, and was embedded as digital watermarking at the time of playback is detected, collating with the medium identification information in BCA of a record medium is performed and playback control is performed according to a collating result according to this operation gestalt as mentioned above, the playback of a record medium by which the dead copy was carried out unjustly can be forbidden.

[0040] In addition, although different ID for each disk of every was used for the identification information of the disk inserted as digital watermarking with this operation gestalt, the identification information of the disk inserted as digital watermarking may show the thing showing the class of disks, such as DVD-RAM, DVD-R, and DVD-RW, or the lot at the time of disk manufacture. Moreover, when inserting different medium identification information for each disk of every, it is not necessary to necessarily insert all the bits of the medium identification information which specifies each disk currently written to the BCA field, and the partial bit may be inserted.

[0041] Moreover, although the work in this operation gestalt was downloaded with the host computer 91 through the network 92 and was recorded on the record medium, it may be what is recorded on the read-only disk, i.e., a software package. In this case, a work is read with a regenerative apparatus and transmitted to a host computer 91. After a host computer 91 stores the transmitted work in memory 95, it is recorded on

a record medium through the same procedure of the 1st operation gestalt.

[0042] (The 2nd operation gestalt) This operation gestalt is an operation gestalt which prevents that the work which the recording device recorded on the record medium is dealt with unjustly. That is, copy generation information should be used with "copy authorization" and "one-generation copy authorization" only in the area where the recording device recorded the work on the record medium on the assumption that use with the individual work with which it was set up. If the record medium concerned is used except the area where the recording device recorded the work on the record medium, it may be unjustly dealt with over the frame of use with the individual record medium.

[0043] What is necessary is just to make it be the following, if playback of the record medium dealt with unjustly such is forbidden. Namely, what is necessary is for the work concerned to embed in the work by making into digital watermarking local information which shows the area used justly, and to perform collating with the local information on the regenerative apparatus concerned, and the local information currently embedded as digital watermarking, and just to forbid playback, if both are inharmonious when a regenerative apparatus orders "Reproduce the work." There are local information which shows the area where the country where the recording device itself is exported and imported, and the recording device concerned are sold to such local information, local information given to the package media which were recording the work concerned, local information which shows the provider who supplied the work through the public network 92 concerned, and the provider (broadcasting station) who broadcast the work concerned by digital satellite broadcasting.

[0044] Henceforth, record processing of the recording apparatus constituted so that an area code might newly be embedded as digital watermarking is realized when CPU107 shown in drawing 1 performs record control according to the flow chart of drawing 8 . Henceforth, record control of CPU107 in the 2nd operation gestalt is explained, referring to drawing 8 . CPU107 makes the copy generation information currently embedded as digital watermarking in the work received to the digital-watermarking detecting element 104 detect in step S501 in drawing 8 first. At step S502, it branches to the processing according to the contents of the copy generation information in digital watermarking. That is, when copy generation information is "more than this copy prohibition" or "a ban on a copy", record of a up to [a disk] is stopped in step S503.

[0045] When copy generation information is "copy authorization" or "one-generation copy authorization", it shifts to step S504 and the area code embedded in the

electronic circuitry of a recording device is acquired from CPU107. In step S505, the digital-watermarking insertion section 105 is made to insert digital watermarking about the area code of a recording apparatus into the received work, and record on a disk is performed at step S506 in it.

[0046] In a regenerative apparatus, playback control at the time of reproducing the work with which the area code was newly embedded as digital watermarking is realized by performing procedure which CPU201 shown in drawing 5 shows to the flow chart of drawing 9 . Henceforth, the procedure of the playback control in the 2nd operation gestalt is explained, referring to drawing 9 . In drawing 9 , it is first directed in step S801 that CPU201 detects an area code and copy generation information from digital watermarking currently embedded at the work read from the record medium to the digital-watermarking detecting element 205. Step S802 compares the area code detected out of digital watermarking, and the area code of the regenerative apparatus acquired from CPU201. When both are inequalities, the playback from a disk is stopped in step S808. When both are in agreement, it moves to the processing after step S804. The information on the disk type distinguished by CPU201 in step S804 is acquired. When a disk type is a disk only for playbacks, it shifts to step S809 and playback from a disk is performed. When a disk type is a recordable disk, it shifts to step S806 and copy generation information is detected as digital watermarking currently embedded at the work read from the record medium. Next, in step S807, copy generation information in digital watermarking is decoded, and it is made to branch to the processing according to these contents. When copy generation information is "one-generation copy authorization" or "a ban on a copy", the playback from a disk is stopped in step S808. When copy generation information is "copy authorization" or "more than this copy prohibition", playback from a disk is performed in step S809.

[0047] According to the gestalt of this operation, it can prevent that the work which the recording device recorded on the record medium is dealt with unjustly by detecting an area code as digital watermarking as mentioned above.

(The 3rd operation gestalt) When broadcasting a work gratuitously by digital satellite broadcasting etc., it is the operation gestalt which controlled the playback quality of the work. There are also many people who there is a program which broadcasts works, such as a movie and music, gratuitously in digital satellite broadcasting, record such a program on a record medium, and appreciate this later. On the other hand, if a movie, music, etc. are broadcast gratuitously by digital satellite broadcasting, the consumers who are going to purchase the software package which recorded these for counter

value will decrease in number. However, if the work recorded from digital satellite broadcasting and the work currently sold as a software package will be differentiated in respect of image quality and tone quality even if the same work was broadcast by digital satellite broadcasting, it is not necessary to make the purchase volition of a software package decline. Therefore, with this operation gestalt, the quality limit information embedded at the work is used that such differentiation should be realized, and the limit of the image quality at the time of playback of a work and tone quality is performed.

[0048] A digital image data quality limit is made here, when a filtering parameter is restricted and it restricts the image quality at the time of playback by quantization width of face. A filtering parameter is a parameter for controlling filtering performed for the Rhine interpolation and pixel interpolation at the time of a video output. Quantization width of face is a parameter for changing the transfer rate at the time of decode of digital image data.

[0049] The quality limit at the time of playback of digitized voice data is made by specifying a sampling frequency and a quantifying bit number. The concrete contents of a sampling frequency or the quantifying bit number are explained using drawing 12 . Drawing 12 shows the situation in case digital data expresses an analog HARASHIN number. In case a sampling frequency decodes digital data to analog data in this Fig., it is the frequency which shows the fixed spacing k1, k2, and k3 for sampling digital value. When it generally samples at 2xB rates/second or more to digital value at the time of decode of digital value, the analog value which has a signal spectrum below the highest frequency B (Hz) can be decoded. It is because the sampling performed at 2xB rates/second or more can restore the signal in a sampling theorem if the highest frequency of the signal spectrum of analog data is set to B (Hz). That is, in playback quality information, if the highest frequency of the signal spectrum of the analog data which should be decoded if a sampling frequency is made high becomes high and makes a sampling frequency low, the highest frequency of the signal spectrum of the analog data which should be decoded will become low. Therefore, if the height of a sampling frequency is adjusted in playback quality information, the precision of the analog data to restore can be changed.

[0050] the shortness j1, j2, j3, and j4 of quantization step spacing indicated to be a quantifying bit number to the amplitude shaft of drawing 12 — it is the number of bits which defines ...... In drawing 12 , the amplitude of digital value is divided at intervals of the quantization step shown in the quantifying bit number, and is approximated to the quantization level nearest to each sampling point. In this Fig. whose drawing 13 is

drawing showing the process in which quantization is performed by rounding off using the quantization bit whose quantifying bit numbers are 8 bits and 9 bits, "0, 1, 2, 3, 4" are illustrated as digital value in case a quantifying bit number is 8 bits, and "0, 1, 2, 3, 4, 5, 6, 7, 8" are illustrated as digital value in case a quantifying bit number is 9 bits. If 1 bit of quantization bits is increased, the number of quantization steps will double, and it turns out that quantization step spacing becomes half.

[0051] If the left-hand side of drawing 13 is referred to, it turns out that an analog value in case a quantifying bit number is 8 bits is expressed as "3." It turns out that an analog value in case a quantifying bit number is 9 bits similarly is expressed as "7." Furthermore, when the maximum quantization error d1 in case a quantifying bit number is 8 bits is compared with the maximum quantization error d2 in case a quantifying bit number is 9 bits, it turns out that the quantization error d2 is reduced by half as compared with d1.

[0052] Thus, when 1 bit of quantization bits was increased, the maximum quantization error also becomes half and a quantization bit is changed from this, it turns out that the precision of the analog data to restore changes. Next, the recording device in this operation gestalt is explained. The internal configuration of the recording device in this operation gestalt is the same as that of what was shown in the 1st operation gestalt, and the limit of playback quality using the above playback quality information is realized by performing record control according to the flow chart of drawing 11 . Henceforth, the record control in the 3rd operation gestalt is explained, referring to the flow chart of drawing 11 .

[0053] In drawing 11 , it is the same as that of step S503 from step S501 of drawing 8 about step S601 to the step S603. In step S604, the playback quality at the time of reproducing based on the decision criterion beforehand defined after identifying the classification of data, once recording the data is determined. In step S605, digital watermarking about the playback quality information determined as the digital-watermarking insertion section 105 is made to insert, and record on a disk is performed in step S606.

[0054] Next, the regenerative apparatus in this operation gestalt is explained. The internal configuration of the regenerative apparatus in this operation gestalt is shown in drawing 10 . The same reference mark is given to the same thing as the component shown in drawing 5 in drawing 10 , and a new reference mark is given to what was added newly (interpolation section 207). Hereafter, the interpolation section 207 newly prepared in drawing 10 is explained.

[0055] If the image and voice which were decoded are outputted from the

digital-watermarking detecting element 205, the interpolation section 207 will respond to playback quality information, and will control the quality at the time of playback of these images and voice. When a work is digital image data here, based on the filtering parameter and quantization width of face which are contained in playback quality information, it directs to perform the Rhine interpolation, pixel interpolation, rate conversion, etc. in the decode section 206, and if a work is digitized voice data, it will direct to sample based on the sampling frequency and quantifying bit number which are contained in playback quality information in the decode section 206.

[0056] Although the internal configuration of the recording device in this operation gestalt is as having been shown above, the limit of playback quality using the above playback quality information is realized by performing playback control according to the flow chart of drawing 14 . Henceforth, the playback control in the 3rd operation gestalt is explained, referring to the flow chart of drawing 14 . Next, the control procedure in this regenerative apparatus when playback quality information is inserted as digital watermarking is described using drawing 14 . In drawing 14 , it is the same as that of processing of step S701 of drawing 6 , step S703, and step S710 about processing of step S1001 and step S1003. If judged with the disk only for playbacks in step S1001, it will shift to step S1002 and playback will be performed. Distinction using the copy generation information in digital watermarking is performed, and if it is "one-generation copy authorization" or "a ban on a copy" as a result, in step S1005, the playback from a disk will be stopped by step S1004. When copy generation information is "copy authorization" or "more than this copy prohibition", the amendment based on the playback quality information in digital watermarking is made to direct in the interpolation section 207 in step S1007, and the decode section 206 is made to start the decode processing based on directions of amendment. Henceforth, it shifts to step S1002 and playback is performed.

[0057] It not only permits or forbids playback, but according to the gestalt of this operation, it becomes possible by detecting playback quality information as digital watermarking to perform extended playback control of performing playback which made playback quality changing as mentioned above. In addition, although the interpolation section 207 was formed in the preceding paragraph of the decode section 206 in drawing 9 , it is also possible to include in the interior of the decode section 206, and to constitute.

[0058]

[Effect of the Invention] The record medium applied to this invention as explained above Since the digital work with which it is given in the condition which cannot alter

medium identification information, and all or a part of the same medium identification information as the medium identification information was embedded as said digital watermarking is recorded The existence of infringement of the copyright of said digital work is verified from all or a part of medium identification information given to the record medium when playback of said digital work was directed, and medium identification information embedded as digital watermarking being collated.

[0059] Even if the duplicate object of the record medium of "more than this copy prohibition" is generated for copy generation information by the dead copy using an inaccurate copy machine, the record medium with which the work was recorded on Shinsei, and its duplicate object are correctly distinguishable. Moreover, since medium identification information is embedded as digital watermarking, it is very difficult to discover where [of a work] it is embedded, and the probability for this medium identification information to be altered is very low. Furthermore, even when it inserts into a work by making the partial bit (N bit) of medium identification information into digital watermarking, it becomes a sheet reproducible [a medium] only at a rate of one sheet the Nth power of 2.

[0060] Since the lot number is embedded as digital watermarking at least among medium identification information at said digital work including the lot number at the time of manufacture of the record medium concerned, said medium identification information does not become reproducible only to a medium with the same lot number. The local information which shows the use area of the recording device which recorded the work concerned on the record medium to said digital work here, The local information given to the package media which were recording the digital work concerned, When any or 1 of the local information which shows the provider who supplied the digital work concerned are embedded in the digital work as digital watermarking, If area code information is inserted as digital watermarking into a work and a limit is imposed on playback of the work concerned according to this, it can prevent beforehand that the record medium which recorded such a work is dealt with unfairly. Moreover, since the work is embedded as digital watermarking, it is difficult to discover where [of a work] it is embedded, and the probability for this work to be altered is very low.

[0061] [when the quality limit information that a limit is imposed is embedded in the digital work as digital watermarking in the playback quality at the time of playback of a digital work here and playback of said digital work is directed] When it constitutes based on the quality limit information on a regenerative apparatus so that the playback quality of the digital work concerned may be restricted, not only control of

the bipolar edge of the playback authorization or prohibition using copy generation information but image quality and tone quality are changed in this case, and the extended control of performing playback becomes possible.

[0062] Even if a movie, music, etc. are broadcast gratuitously by digital satellite broadcasting even if and these are recorded on a record medium, such a work and the work currently sold to normal as a software package can be differentiated in respect of image quality and tone quality. Moreover, since playback quality information is embedded as digital watermarking, it is difficult to discover where [of a work] it is embedded, and the probability for this playback quality information to be altered is very low.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the interior of the personal computer 90 equipped with a recording device.

[Drawing 2] It is the flow chart which shows record control of the recording apparatus in the 1st operation gestalt.

[Drawing 3] It is drawing showing the copy control using copy generation information.

[Drawing 4] It is drawing having shown the physical structure of the recordable disk 108.

[Drawing 5] The block block diagram of the regenerative apparatus in the 1st operation gestalt is shown.

[Drawing 6] It is the flow chart which shows the procedure of the playback control in the 1st operation gestalt.

[Drawing 7] It is an explanatory view for explaining prohibition of playback by the regenerative apparatus in the 1st operation gestalt.

[Drawing 8] It is the flow chart which shows record control of the recording apparatus in the 2nd operation gestalt.

[Drawing 9] It is drawing showing the procedure of the playback control in the 2nd operation gestalt.

[Drawing 10] It is drawing showing the interior of the regenerative apparatus in the 3rd operation gestalt.

[Drawing 11] It is the flow chart which shows record control of the recording apparatus in the 3rd operation gestalt.

[Drawing 12] The situation in case digital data expresses an analog HARASHIN number is shown.

[Drawing 13] It is drawing showing the process in which quantization is performed by rounding off using the quantization bit whose quantifying bit numbers are 8 bits and 9 bits.

[Drawing 14] It is drawing showing the procedure of the playback control in the 3rd operation gestalt.

[Drawing 15] It is drawing showing the copy control using copy generation information.

[Drawing 16] It is the explanatory view showing the playback control using copy generation information.

[Drawing 17] It is drawing showing signs that the work with which digital watermarking is embedded is copied using an inaccurate copy machine.

[Description of Notations]

90 Personal Computer

91 Host Computer

92 Public Network

93 Communication Adapter

94 Interface Control Section

95 Memory

101 Signal-Processing Section

102 Interface Control Section

103 Optical Head

104 Digital-Watermarking Detecting Element

105 Digital-Watermarking Insertion Section

107 CPU

108 Recordable Disk

201 CPU

202 Optical Disk

203 Optical Head

204 Signal-Processing Section

205 Digital-Watermarking Detecting Element

206 Decode Section

207 Interpolation Section